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## THE NEXT STEP IN CONTENT IN JUNIOR HIGH SCHOOL MATHEMATICS\*

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The next step relating to subject matter of the Junior High School is really the first step—for we can hardly be said to have taken that as yet.

The problem resolves itself into recognizing that mathematics permeates every science that we have, every department of business activity, and, indeed, most of the other fields of human interest, and that the first step is to ascertain precisely what phases of mathematics are needed by the average, well-informed citizen in order that he may understand any one of the manifold lines of human activity in which the science plays an important role. We have made a fair beginning in the solution of this problem, but that which constitutes a solution today ceases to be a complete solution tomorrow because of the rapid changes in the applications of mathematics to the various lines of human activity.

No one wishes to preserve the dull, uninteresting, unusable parts of mathematics, and the teachers of the science are today the leaders in replacing this material by that which meets current human needs. It seems indisputable, however, that the average, fairly-well educated American citizen should know such uses of elementary algebra as depend upon the formula, the graph, the negative number, and the simple equation. It also seems evident that he should know the significance of and be privileged to enjoy a subject like intuitive geometry, and that the meaning of the trigonometry of the right triangle should be made clear to him through such common applications as he is likely to meet within the ordinary reading of elementary science. It also seems desirable that he should know the meaning of a geometric proof—the only opportunity that he has to come into close contact with deductive logic in his work in the secondary school.

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\* Synopsis of an address given at the New York Section of the Association of Teachers of Mathematics in the Middle States and Maryland. December 2, 1921.

The material necessary to accomplish this result is not extensive. It should be and is usually arranged for teaching in psychological order, and for myself I should be glad if it were so planned that the pupil might enter any class without having necessarily passed the preceding work. This would mean that a pupil who fails might substitute another subject by which to make up his deficiency, if he so desired, but that in any case he could proceed with his mathematics. This would assure to every individual a fair all-round knowledge of the essentials which everyone should know, without requiring the impossible in the exceedingly rare case of a pupil who cannot, under a teacher of fair ability, master the elementary work that is covered in the junior high school.

To place all human knowledge upon a dead level of importance, as some of our esteemed friends in the educational world seem to advocate, is hardly worthy of discussion. A few great branches, like mathematics, correlate so closely with every other branch as to make their teaching an imperative requirement, and one purpose of the junior high school is to present such branches to the pupils of the seventh, eighth and ninth school years.

I do not suggest the disciplinary value of mathematics, because the idea that "the doctrine of mental discipline has been exploded" has itself been so thoroughly exploded by the results of the recent inquiry made of a body of leading American psychologists by the National Committee that we may consider the discussion a matter of ancient history. At any rate, however, no one puts forth any claim that this is the determining reason for the teaching of mathematics.

There should be mentioned in this connection, the danger of so humanizing our mathematics as to leave in the pupil's mind a rather large amount of humanity, but no mathematics at all. There should also be mentioned the fact, patent to every successful teacher, that one of our greatest purposes is to reveal to the student something of the soul of our science. It is only with this purpose in mind that we shall succeed in our teaching of what an ancient and worthy Oriental writer called "the science venerable"—a phrase which, etymologically as well as actually, means "the knowledge lovable."